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November 9, 2000



**VIA HAND DELIVERY**
Magalie Roman Salas, Secretary
Federal Communications Commission
445 12th Street, S.W., Room TW-A325
Washington, DC 20554

Re: Larsen Cellular Communications, Ltd.
TRS No. 812371
**CC Docket No. 94-102, Wireless E-911 Report**

Dear Ms. Salas:

On behalf of Larsen Cellular Communications, Ltd. ("Larsen"), transmitted herewith are an original and four copies of Larsen's Report on Implementation of Wireless E-911 Phase II Automatic Location Identification. A copy of this document on diskette is being served on the Commission's copy contractor, International Transcription Service, Inc.

Please contact the undersigned if you have any questions concerning this filing.

Respectfully submitted,

T. Michael Jankowski

TMJ:las

Enclosures

cc (w/encl.): Jay Whaley, FCC
David H. Larsen
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**Report on Implementation of Wireless E911**

**Phase II Automatic Location Identification**

## Carrier Identifying and Contact Information

This report provides certain information relative to the planned implementation of Wireless E911 Phase II Automatic Location Identification in Florida 7-Hamilton Rural Service Area ("FL 7 RSA"). This report is submitted on behalf of **Larsen Cellular Communications, Ltd** ("LCCL") using TRS number **812371**.

This report has been prepared by:

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## Service Territory Description

LCCL provides CMRS services to a four county area, comprised of Hamilton, Suwannee, Columbia and Union Counties, in North Central Florida. The population of this service territory is less than 150,000 with two major population centers containing less than 25,000 each. However, there are two major interstate highways traversing the area, indicating that many of the users utilizing LCCL's network are roamers from other service territories and are customers of LCCL's roaming partners.

## History and Current E911 Status

The service territory of LCCL has but four (4) Public Safety Answering Points (PSAP). Each county maintains its own PSAP with varying capabilities. LCCL does not currently provide any specific location information to any PSAP. LCCL does selectively route **all** 911 calls, regardless of user status, to the nearest PSAP based on specific base station geography. To date, LCCL has received no Phase II requests from any PSAP.

For Phase I requests, LCCL has planned to configure a CAS or "Callpath Associated Signaling" system. This system requires LCCL to implement software (which provides originating cellsite location data) into its Mobile Switching Center ("MSC") and establish high capacity digital circuits from its MSC to the designated selective router or 911 tandem switch determined by the requesting PSAP and the local exchange carriers. All

911 calls originating through base stations within the county which the requesting PSAP serves will be routed via this facility(s).

**E911 Phase II Location Technology**

LCCL's original intention under the FCC's Rules and Regulations was to implement Phase II using handset technology. However, LCCL has reconsidered and decided to pursue a network based technology for two major reasons: First and primary, as stated herein, LCCL's network supports a substantial number of roaming customers (It is LCCL's understanding that the majority of its roaming partners will utilize network based location systems). If LCCL were to utilize a handset-based solution, the purpose of Phase II would likely be defeated for the majority of emergency callers (with. legacy handsets and non location based handsets), the PSAP calltakers and emergency services providers within the LCCL service territory. In addition the lack of availability of certified handsets that would allow for Phase II location favors a network-based solution. As a small service provider, LCCL experiences difficulty obtaining handsets that are in current production, mainly due to the lower volumes that LCCL requires. Specialized handsets will be at premium for both availability and cost until such time as production quantities reach large volumes. It is LCCL's concern that if it elects to utilize the handset technology approach, it will not be able to obtain sufficient quantities of handsets to comply with the FCC's Rules and Regulations regarding implementation timelines.

**Types of Technology/PSAP Interface**

LCCL has not selected a specific vendor to provide its network solution for location. However, it is evaluating two vendors' solutions and will select one of the following for the Florida 7 RSA service territory.

LCCL is evaluating a network-based solution provided by Geometrix ®, a division of Allen Telecom. This product requires the installation of Wireless Location Sensors ("WLS") at each of LCCL's base stations and a Geolocation Control System ("GCS") at LCCL's MSC. In addition, Operation Support System functionalities such as alarming and performance monitoring are ported to external devices via a common interface. Each of the WLS units is connected to the GCS via an independent data channel. Each WLS will be coupled to the existing receive antenna system as well as being equipped with a separate antenna system at each base station.

The system operates on the principal of Time Difference of Arrival ("TDOA") and Angle of Arrival ("AOA"). TDOA works by measuring the exact time of arrival of a handset radio signal at three or more separate base stations. Using this data, calculations can be performed by the GCS to create intercepting hyperbolas at which point of intersection exact latitude and longitude can be derived. AOA determines direction of arrival of a handset signal at the base station. A calibrated antenna array at the base station will produce received signal phase differences depending on direction of travel of the handset. Collected data from two or more cellsites will be used by the GCS to calculate intersecting hyperbolas at which intersection latitude and longitude can be derived.

The GCS then applies spatial algorithms to overcome various radio frequency characteristics such as multipath and co-channel interference to produce a location value within acceptable tolerance.

Although field trials have proven that TDOA by itself can provide location data within acceptable tolerance, LCCL will utilize both TDOA and AOA since its base station network supports a predominantly rural environment thus greater accuracy can be assured. In addition, LCCL employs cellular repeaters at three of its base station locations or over 25 percent of its total cellsite deployment. These repeaters are products of an Allen-Telecom division and therefore the product described above can be integrated without major modifications to LCCL's base station network.

The GCS located at LCCL's MSC can be integrated into the PSAP interface with some modification. As indicated herein, LCCL plans to initially provide Phase I service to one or more PSAPs via a CAS configuration. To integrate the GCS and reduce call completion times , the PSAP interface will be reconfigured to NCAS or "Non Callpath Associated Signaling". Existing voice path circuits will remain in place and two (2) signaling circuits will be added. This process will be transparent to the PSAP(s) and the emergency caller. The PSAP, rather than seeing a base station location on its console, will instead view the actual location of the caller either via a data form or a map view depending on the technology used by the PSAP.

The second system considered by LCCL is one manufactured by US Wireless Corporation. This system utilizes a unique detection and identification process called "Location Pattern Matching" and its network is called The Radio Camera ™ Network. Rather than utilizing multiple base stations, this system uses but one base station, apparently making the use of it more accurate in the FL 7 RSA rural environment. By analyzing the unique signal pattern emanating from any geographic location and storing such data in a database, if a signal is received from the same location, a lookup occurs and the location is identified. Dynamic updating of the database occurs constantly on any transmission regardless of whether the call is an emergency call, therefore the reliability and accuracy of the database remains high.

This network also is unique in that it will be connected to a data hub, therefore rendering the ability of the Manufacturer to offer " service bureau" functionalities. This can be translated into potential cost savings by reducing initial capital costs and lowering non recurring costs, which should reduce drain on public funding for Phase II services.

Integration of this network into the PSAPs will require the removal of the CAS system initially designed for the FL 7 RSA service territory and the utilization of the NCAS system of the service bureau provided by the service provider, US Wireless Corp.

Regardless of vendor product, LCCL intends to utilize Phase I or cellsite location data generated internally with the cellular network as backup location data in the unlikely event of Phase II location network failure.

## Implementation Details and Schedule

LCCL will release, in early 2001, a Request for Proposal ("RFP") to the vendors indicated herein and any other vendor that LCCL determines would qualify. The RFP will contain, among other common requirements, a detailed timeline. The timeline will include an initial location network layer (a layer is defined herein as a cellsite or group of cellsites which cover a PSAP's geographic area). The first location network layer will be subjected to a rigorous test (see Testing and Certification below) prior to acceptance and certification by LCCL and prior to integration into the existing or future PSAP network interface. As part of this acceptance test, the vendor(s) must be able to demonstrate that the test network will not only comply with the requirements set forth by the FCC's Rules but also no additional latency, in excess of acceptable limits, in call setup or completion time will be introduced in calls routed to and completed at the PSAP.

It is expected that deployment of the first location network layer will occur prior to mid 2001. Acceptance tests will be conducted and the first system will be deemed certified on or before October 2001. Depending on the date of a PSAP request, the certified system will then be integrated into the PSAP interface by adding/modifying the PSAP interface and/or simply adding a base station(s) to the existing certified location network.

The first location network layer will encompass a geographic area that services almost sixty (60) percent of the total calls placed on the LCCL cellular network. In addition, the first location network layer will service 100 percent of the total callers within the PSAP area that is anticipated to be the first to request Phase II. Adding one (1) to a maximum of three base station units (either WLS or Radio Camera™) depending on requesting PSAP will allow for 100 percent caller coverage in that requesting PSAP area. Deployment of the base station units will be accomplished within a short time frame from the date of request. Integration and testing with the individual PSAP will be scheduled and completion and certification by both parties will occur within six (6) months from the date of request.

## Testing and Certification

LCCL has not performed any statistical or empirical tests on any location product to date. It has, however, reviewed and considered data contained in reports provided by the vendors mentioned herein and others. Non-proprietary information may be viewed by selecting the appropriate vendors Web page. For example, US Wireless Corp has referred to a report generated by the State of Montana on field trials conducted in that state. In addition, Geometrix has provided information relative to field trials conducted in Lexington, KY.

Inasmuch as both vendors listed above have conducted field trials with topography and morphology similar to that found in LCCL's service territory, LCCL views the data from both vendors as germane to LCCL's applications.

LCCL, as part of the procurement process, intends to conduct an acceptance and certification process on the first network layer implemented. A test plan is being developed based on the FCC's Office of Technology's OET Bulletin No. 71 and/or an appropriate test plan developed by the appropriate standards body. LCCL and selected vendor(s) will perform empirical testing on the first location network layer installed. The first network layer will be incorporated into base stations of which the composite radio frequency coverage consists of lengths of limited access highways (Interstates 10 and 75) and one of the major population centers in LCCL's territory, Lake City, Florida. LCCL provides for both AMPS analog and TDMA digital service so testing will be performed with handsets using both technologies. LCCL may utilize subscriber sets other than handsets within certain geographic areas; however, these units will be used to provide supplementary data rather than primary data. Handsets are the predominant subscriber set in use, and therefore these units will be utilized throughout the test program.

LCCL intends to perform testing in the following areas:

1. Limited Access Highways
   a. Mobile use inside vehicles while traveling at highway speed.
   b. Fixed locations such as overpasses, call box locations, rest areas and other locations where vehicles may be motionless. (Testing to occur with handset inside and outside vehicle.)
2. Rural Highways and Roads
   a. Mobile use inside vehicles while traveling at rated speed.
   b. Fixed locations such as intersections, curves and other locations where vehicles may be motionless. (Testing to occur with handset inside and outside of the vehicle.)
3. City Street
   a. Mobile use inside vehicles while traveling at rated speed.
   b. Fixed locations such as intersections with traffic control devices, cul-de-sacs, etc. (Testing to occur with handset inside and outside vehicle.)
   c. Areas of use shall include industrial, commercial and residential development
4. Buildings
   a. Commercial areas with pedestrian use, particularly large retail buildings, restaurants and other public gathering places.
   b. Downtown Lake City business district--on the street and within the first and second floors of buildings. (There are no buildings over 3 stories)
   c. Certain selected residential structures, particularly those in rural areas that are of manufactured home construction.

A base set of randomly generated locations will be developed for each of the above described areas. The locations will be compared with existing empirical data to determine the nature of the service affecting that particular location, i.e. terrain blocking,

heavy vegetation, building construction, etc. All data shall be recorded and sufficient enough number of locations generated for each to statistically insure high probability of accurate data collection. Upon completion of selection, geographic base location data will be determined using Differential Geo-positioning Systems which provide a high level of accuracy.

After testing of the first location network layer, the data will be tabulated and compared to that expected. Anomalies will be identified and retesting will occur if necessary. Upon final testing, all data will be combined and evaluated against standards established within the FCC Rules to insure compliance.

Call completion timing tests will occur using internal routing to insure that the location data acquisition and porting does not add significant latency. Upon integration of location network layer(s) into any PSAP interface, testing will occur that measures time latency.

Routine maintenance programs will also be developed and instituted to continue monitoring the accuracy of the location network. Baseline locations with empirical data will be utilized and compared with that obtained via the location network. Furthermore, a procedure will be instituted with the PSAP(s) that will provide rapid feedback to LCCL network operations in the event of failure or inaccurate location data. This process is expected to assist in the refinement of the location network.